ARX®6000 Hardware Installation Guide

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Table of Contents

I		
Introduction		
	Audience for this Manual	1-3
	Document Conventions	
	Related Documents	I-4
	Safety and Regulatory Notices	1-5
	Class A ITE Label	
	Qualified Personnel Warning	
	Environmental	I-6
	Power	1-7
	Laser Product Notice	1-10
	Contacting Customer Service	1-11
2		
2		
Product Overview		
	The ARX®	2-3
	Redundancy Features	
	Switch Management	
	Supported Protocols	
	Network	
	File Services	
	Security and Authentication	
	Management	
	r ianagement	2-0
-		
3		
Chassis Hardware		
	Chassis Components	3-3
	Power Supply	
	Disk Drives	
	Fan Tray Module	
	Chassis Configurations	
	Redundant Pairs	
	Resilient Overlay Network (RON)	
	Resilient Overlay (vetwork (NOIV)	5-/
4		
4		
Hardware Modules		
	System Control Module (SCM)	4-3
	Features	4-4
	Dual-Channel SCM	
	Adaptive Services Module (ASM)	
	Features	
	Network Services Module (NSM)	
	NSM-TX	
	NSM-FX	
	Features	
	i Catul 63	7-/
г		
5		
System Specification	ns	
,	System Specifications	5_2
	System Power Requirements	

	Power Cord and Cable Requirements	5-5
	Regulatory Compliance	5-6
	FCC Compliance	5-6
6		
Unpacking and Ins	talling the Chassis	
- P	Safety Instructions	6-3
	Required Tools and Equipment	
	Verifying Shipment	
	Unpacking the Chassis	
	Removing the Fan Tray	
	Removing the Power Supplies	6-7
	Rack-Mounting the Chassis	6-9
	Installing the Front Bezels	6-9
	Fan Tray	6-10
	Utility Bay	6-10
	Attaching the Power Cords	6-11
	Powering Up the Chassis	6-12
	Cabling the Modules	6-13
	Air Filter and Cable Management	
	Installing the Air-Filter Panel and Cable Guide	6-14
7		
Connecting the Sv	witch to the Network	
O .	Management Interfaces	7-3
	Connecting the Console Terminal	
	Booting the Switch	
	Sample: Booting a Non-Replacement Switch	
	Preparing for Switch Replacement	
	Installing a Redundant Peer or Cluster	
	Sample: Replacing a Redundant Peer	
	Connecting the Ethernet Management Port	
8		
Maintenance		
· iaiiioiiaiico	Powering Down the ARX®6000	8-3
	POST Diagnostics	8-3
	LED Status Indicators	8-5
	Module Status LEDs	
	Ethernet-Port Link Status LEDs	8-7
	Disk Drive LEDs	8-7
	Fan Tray LEDs	8-7
Α		
Cable Connectors		
	ARX [®] 6000 Connectors	Δ_3
	Console Connector and Pinouts	
	SFP Optical Connector	
В		
D		
Removing and Rep	placing FRUs	
	Before You Begin	B-3

Removing and Replacing Modules	B-3
Removing and Replacing a Disk Drive	
Silencing the RAID Alarm	B-5
Replacing the Disk Drive	
Removing and Replacing the Fan Tray	B-6
Removing and Replacing a Power Supply	B-7
Removing and Replacing the Air Filter	

Introduction

This manual describes F5's Adaptive Resource Switch 6000 (ARX $^{\$}$ 6000) and its hardware components. It also describes how to install the switch and connect it to the network.

This chapter contains the following sections:

- Audience for this Manual
- Document Conventions
- Related Documents
- Safety and Regulatory Notices
- Contacting Customer Service

Audience for this Manual

This manual is intended for field engineers and network administrators responsible for setting up and connecting the switch to a network at the enterprise data center facility.

Document Conventions

This manual uses the following conventions, when applicable:

- courier text represents system output
- bold text represents user input
- italic text appears for emphasis, new terms, and book titles



Notes provide additional or helpful information about the subject text.

♦ Important

Important notices show how to avoid possible service outage or data loss.

WARNING

Warnings are instructions for avoiding damage to the equipment.

DANGER

Danger notices help you to avoid personal injury.

Related Documents

In addition to this guide, the following F5 Data Solutions documentation is also available:

- ARX®6000 Quick Installation
- ARX®500 Hardware Installation Guide
- ARX®1000 Hardware Installation Guide
- ARX®2000 Hardware Installation Guide
- ARX®4000 Hardware Installation Guide
- ARX® GUI Quick Start: Network Setup
- ARX® CLI Reference
- ARX® CLI Network-Management Guide
- ARX® CLI Storage-Management Guide
- ARX CLI Maintenance Guide

Safety and Regulatory Notices

lmportant 🔷

The ambient room temperature range that the unit can operate in is $5-35^{\circ}$ C.

lmportant

Do not block power supply vents or otherwise restrict airflow when installing unit in rack.

WARNING

Mechanical loading of rack should be considered so that the rack remains stable and unlikely to tip over.

Class A ITE Label

この装置は、情報処理装置等電波障害自主規制協議会(VCCI)の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may occur, in which case, the user may be required to take corrective actions.

Qualified Personnel Warning

WARNING

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

ATTENTION

Il est vivement recommandé de confier l'installation, le remplacement et la maintenance de ces équipements à des personnels qualifiés et expérimentés.

Environmental

High Temperature Warning

WARNING

To prevent the switch from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of $104^{\circ} F$ ($40^{\circ} C$). To prevent airflow restriction, allow at least 3 inches (7.6 cm) of clearance around the ventilation openings.

ATTENTION

Pour éviter une surchauffe du commutateur, ne pas le faire fonctionner dans un local dont la température ambiante dépasse le maximum recommandé de 40 \xb0 C (104 F). Pour faciliter la circulation d'air, aménager un dégagement d'au moins 7,6 cm (3 pouces) autour des bouches d'aération.

Restricted Area Warning

WARNING

This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

ATTENTION

Cet appareil est à installer dans des zones d'accès réservé. Ces dernières sont des zones auxquelles seul le personnel de service peut accéder en utilisant un outil spécial, un mécanisme de verrouillage et une clé, ou tout autre moyen de sécurité. L'accès aux zones de sécurité est sous le contrôle de l'autorité responsable de l'emplacement.

Warning for Rack-Mounting and Servicing

WARNING

To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

• If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

ATTENTION

Attention Pour éviter toute blessure corporelle pendant les opérations de montage ou de réparation de cette unité en casier, il convient de prendre des précautions spéciales afin de maintenir la stabilité du système. Les directives ci-dessous sont destinées à assurer la protection du personnel:

- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.
- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

Power

Power Cord Usage

WARNING

Do not use the attached power supply cable for other devices or usage.

WARNING

The attached power supply cable was designed to be connected and to be used for F5 devices, and the safety for this purpose has been confirmed.

WARNING

Please do not use it for other devices or usages. There may be danger of causing a fire or an electric shock.

注意 - 添付の電源コ?ドを他の? 置や用途に使用しない 添付の電源コ?ドは本? 置に接? し、使用することを目的に設計され、その安全性が確認 されているものです。決して他の? 置や用途に使用しないで下さい。火災や感電の原因と なる恐れがあります。

Electric Shock Warning

WARNING

This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit.

ATTENTION

Il est possible que cette unité soit munie de plusieurs cordons d'alimentation. Pour éviter les risques d'électrocution, débrancher les deux cordons d'alimentation avant de réparer l'unité.

SELV Circuit Warning

WARNING

The ports labeled LINK, 1/1 through 1/6, CONSOLE, MGMT, MIRROR, and DEBUG are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits.

ATTENTION

Les ports étiquetés LINK, 1/1 through 1/6, CONSOLE, MGMT, MIRROR, et DEBUG sont des circuits de sécurité basse tension (safety extra-low voltage ou SELV). Les circuits SELV ne doivent être interconnectés qu'avec d'autres circuits SELV.

Circuit Breaker (15A)

WARNING

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors).

ATTENTION

Pour ce qui est de la protection contre les courts-circuits (surtension), ce produit dépend de l'installation électrique du local. Vérifier qu'un fusible ou qu'un disjoncteur de 120 V alt., 15 A U.S. maximum (240 V alt., 10 A international) est utilisé sur les conducteurs de phase (conducteurs de charge).

Power Supply Disconnection Warning

WARNING

Before working on a chassis or working near power supplies, unplug the power cord on AC units.

ATTENTION

Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher lecordon d'alimentation des unités en courant.

Battery Handling Warning

WARNING

There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

ATTENTION

Danger d'explosion si la pile n'est pas remplacée correctement. Ne la remplacer que par une pile de type semblable ou équivalent, recommandée par le fabricant. Jeter les piles usagées conformément aux instructions du fabricant.

International Power-Cord Requirements

International cords should have the following characteristics:

- maximum length: 4.5 m/15 feet
- Female End: IEC-320-C13
- Capacity: 10A/250V
- Nominal Conductor size(s): 1.0mm2
- Approvals: Appropriate to the country in which it is to be used.

Grounded Equipment Warning

WARNING

This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.

ATTENTION

Cet équipement doit être relié à la terre. S'assurer que l'appareil hôte est relié à la terre lors de l'utilisation normale.

Laser Product Notice

WARNING

Class 1 laser product.

ATTENTION

Produit laser de classe I.

Class 1 lasers are defined as products which do not permit human access to laser radiation in excess of the accessible limits of Class 1 for applicable wavelengths and durations. These lasers are safe under reasonably foreseeable conditions of operation.

WARNING

Do not stare into the beam or view the beam with optical instruments.

Harmonized IC Label Requirements: The following statement is applicable to products that are intended for market in Canada under the harmonized FCC-DOC EMI requirements. Equipment Requirements for units imported into Canada shall bear both English and French translations as follows:

"This digital apparatus does not exceed the Class A or B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

This Class A or B digital apparatus complies with ICES-003

"Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.'1

Cet appareil numerique de la classe A or B est conforme a la norme NMB-003 du Canada.

Contacting Customer Service

You can use the following methods to contact F5 Networks Customer Service:

F5 Networks Online Knowledge Base	http://support.f5.com
Online repository of answers to frequently-asked questions.	
F5 Networks Services Support Online	https://websupport.f5.com
Online customer support request system	
Telephone	Follow this link for a list of Support numbers:
	http://www.f5.com/training-support/cust omer-support/contact/



Product Overview

This chapter provides a general overview of the F5 ARX $^{\odot}$ 6000. Topics include the following:

- The ARX®
- Redundancy Features
- Switch Management
- Supported Protocols

The ARX®

The Adaptive Resource Switch (ARX®) 6000 is a 6-slot switch for use in large data centers and regional data centers. The switch enables enterprises to globally access, manage, deliver and optimize information resources. The ARX® aggregates multiple disparate storage into a unified global file system, eliminating stranded capacity and employing intelligent policies to optimize costly storage resources. The switch performs this aggregation across different storage-access protocols, classes of storage, physical locations, and multi-vendor equipment.

The switch optimizes file storage and server capacity and simplifies resource management. Because it resides in the data path, the switch is aware of attached storage, server, and network resources and how they are used. It then dynamically adapts the infrastructure to meet user demands.

The switch consists of a 6-slot chassis that accommodates a system management and control module and a family of service modules that support Fast Ethernet and Gigabit Ethernet interfaces for connectivity to network infrastructure, network-attached storage (NAS) devices, and file servers with direct-attached storage (DAS).

The switch's 80-Gbps aggregate switching capacity ensures non-blocking throughput for all modules in the system. The switch also provides high-speed TCP and Secure Sockets Layer (SSL)/IPsec offload capability.

The switch is highly available, providing module-level redundancy, switch-to-switch redundancy, redundant power, and RAID Level 1 mirroring technology. In addition, all field replaceable units (FRUs) in the system are hot-swappable.

The ARX® has a secure and reliable mechanism for switch-to-switch communications in order to provide switch redundancy and to provide transparent access to distributed file storage resources. This site-to-site communication network is established through a *Resilient Overlay Network (RON)* tunnel, which is configured over an existing IP infrastructure.

Redundancy Features

The ARX®6000 system is designed to provide a highly available service with fault tolerance and no single point of failure. This design provides the following features:

- High availability (HA) clustering for switch redundancy, including intra-box (modules) and inter-box (redundant-pair) failover capability:
- For multiple NSMs in a single chassis, if a one fails the other provides connectivity for all other modules.
- For two switches in a redundant pair, one switch starts as *primary* and the other switch starts as *secondary*. If a module in the primary switch fails, the switch "fails over" to the secondary switch.
- Redundant Array of Independent Disks (RAID) Level 1 protected boot/configuration disk drives.
- Redundant power supplies installed share the power load.
- Redundant connections to the fan tray.
- Redundant AC/DC power.

See <u>Chapter 3</u>, <u>Chassis Hardware</u>, for more information about these chassis components.

Switch Management

For local and remote management, the ARX®6000 provides the following management interfaces:

- one serial-console port (labeled "Console"),
- one out-of-band 10/100 Ethernet port (labeled "MGMT"), and
- a configurable number of inband Ethernet interfaces.

See <u>Chapter 7, Connecting the Switch to the Network</u>, for information about bringing the out-of-band MGMT port online after initial boot-up.

See the <u>ARX® CLI Network-Management Guide</u> and <u>ARX® CLI Reference</u> for information about configuring the in-band interfaces.

Supported Protocols

The ARX® supports a range of network, application, and file-access protocols, including the following:

- Layer 2 and layer 3 network protocols
- Common management protocols
- Security and file service protocols for data encryption, exchange, backup/restore, and storage management

Network

• 802.1D and Rapid Spanning Tree

♦ Note

In 802.1D mode, the switch executes the 802.1S protocol in 802.1D compatibility mode. This allows inter operability with legacy 802.1D-only devices.

- VLAN (802.1Q)
- passive link aggregation (802.3ad), without LACP
- Internet Protocol (IP)
- Transmission Control Protocol/User Datagram Protocol (TCP/UDP)
- Domain Name Service (DNS), as a client
- Network Time Protocol (NTP), as a client

File Services

- Common Internet File System (CIFS)
- Network File System (NFS): NFSv2 over UDP and NFSv3 over TCP or UDP
- Network Locking Manager (NLM)

Security and Authentication

- NT LAN Manager (NTLM) v1
- NT LAN Manager (NTLM) v2
- Network Information Service (NIS, also known as YP)
- · Kerberos authentication for Windows clients
- Remote Authentication Dial-In User Service (RADIUS) for administrators

Management

- Simple Network Management Protocol (SNMP)
- TELNET
- SSH (Secure SHell)
- Hypertext Transfer Protocol (HTTP)
- Hypertext Transfer Protocol over SSH (HTTPS)
- SOAP-based API over HTTP and/or HTTPS
- For transferring maintenance and release files:
 - File Transfer Protocol (FTP)
 - Trivial File Transfer Protocol (TFTP)
 - Secure Copy (SCP)
 - NFS, for transfers to or from an ARX volume
 - CIFS, for transfers to or from an ARX volume
 - Simple Mail Transfer Protocol (SMTP), for sending email notices of trouble conditions



Chassis Hardware

This chapter describes the switch chassis components and hardware configuration.

Topics include the following:

- Chassis Components
- Chassis Configurations
- Redundant Pairs
- Resilient Overlay Network (RON)

This chapter describes *chassis hardware* only. For information about hardware modules (management and service modules), see <u>Chapter 4</u>, <u>Hardware Modules</u>.

Chassis Components

The F5 ARX®6000 is a 6-slot chassis that mounts into a standard 19-inch rack. The first slot is reserved for switch management, control, and switch-fabric functions. The remaining five slots support interchangeable installation of I/O service modules.

- Slot 1 is reserved for the System Control Module (SCM) which provides switching and management functions.
- Slots 2 through 6 are available for all service modules in a system configured for 220V power.
- All modules are field-replaceable.

The chassis is shipped with all components installed per customer order. Components include all management and service modules, power supplies, disk drives, and fan tray (includes six fans).

The chassis utility bay accommodates two system disk drives and up to two power supplies.

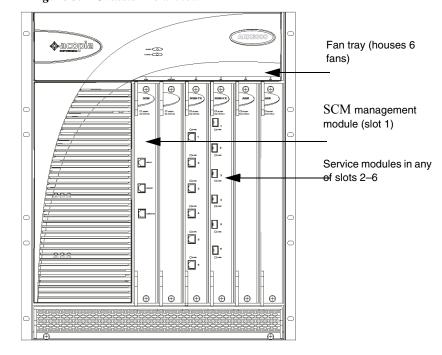


Figure 3.1 Chassis Front View

Power Supply

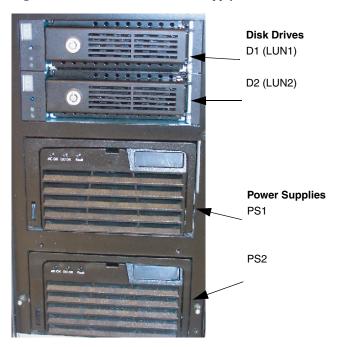
The switch is powered by one or two fully managed AC/DC power supplies. Two power supplies are recommended for full redundancy and load-sharing.

Each power supply provides the following:

- 1500 W @ 220 Vac (Note: the system draws 1704 W from the power cord due to the less-than-100% efficiency of the power supplies.)
- -48 Vdc output power
- Load sharing between two power supplies
- Separate AC line power cord for each power supply unit
- Separate AC Fail and DC Fail fault indicators per power supply unit
- Power Fail and over-temperature alarms displayed on system console
- Hot swappable and front accessible components

See for power requirements and specifications.

Figure 3.2 Disk Drive and Power-Supply Locations

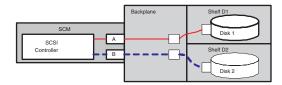


Disk Drives

The switch requires two system disk drives for operation. Together the two disk drives provide RAID Level 1 redundancy. The drives contain software images, reports, scripts, log files, and configuration files.

The disk drives are connected through a SCSI bus to the System Control Module (SCM) in the chassis. The dual-channel SCM communicates over two separate buses to the disk drives in bay shelves D1 and D2. <u>Figure 3.3</u> shows the SCM-to-drive interconnections.

Figure 3.3 Dual-Channel Internal Drive Connections



Logical Unit Numbers (LUNs)

Each system drive has a *logical unit number* (*LUN*) (address 1 and 2) corresponding to bay slot 1 (D1) and bay slot 2 (D2). Dual-channel drives are mapped to LUNs 1 and 2. LUNs enable multiple drives to be "daisy-chained" to a single controller. The LUN address identifies the drive so that the controller can send the correct data to the correct drive(s).

Status LEDs

The disk drives provide three status LEDs:

- Red indicates Activity
- Green indicates Power
- Orange indicates Failure

Fan Tray Module

The chassis fan tray module is an environmentally controlled fan system with an intelligent fan controller. The fan tray contains six individual fans and is located at the top of the chassis (refer back to in <u>Figure 3.1 on page 3-3</u>).

The "hot-pluggable" fan tray (containing six fans) is a field replaceable unit (FRU) that can be replaced without service interruption. See <u>Appendix B.</u> <<u>Emphasis>Removing and Replacing FRUs</u> for information about removing/replacing FRUs.

The SCM has redundant connections to the fan tray module for temperature control and status monitoring. It communicates with the fan tray module at regular 60-second intervals.

Features

The fan tray module provides the following features:

• Fan speed controlled through a pulse modulated input to the fan

- Fan speed controlled by SCM in response to temperature fluctuations in the chassis
- Fan tachometer monitors revolutions per minute (RPM)
- Closed-loop system monitors temperature conditions in the chassis with a return to the fan system; this causes airflow to increase or decrease, as required, to maintain the proper temperature within the chassis
- Two LEDs on the fan-tray front panel indicate operational status (see <u>Chapter 8, Maintenance</u> for LED descriptions)
- Failure indications include:
 - · Single fan failure
 - Multiple fan failure
 - · Low/high RPM on any fan
 - · High temperature
 - Lost SCM-to-fan tray communication

Chassis Configurations

The ARX®6000 can accommodate up to six modules in its chassis, and these modules can be configured to maximize throughput or to maximize high availability between switches.

The switch currently supports one management module (SCM) in slot 1 and service modules (NSM and ASM) in any order (or combination) in the service module slots. Most configurations require at least one NSM for network connectivity and one ASM for adaptive services. See <u>Chapter 4</u>, <u>Hardware Modules</u> for information about the individual ARX®6000 modules.

<u>Table 3.1</u> describes the basic and maximum capacity ARX®6000 chassis configurations.

Basic System		Maximum Capacity	
Slot	Module	Slot	Module
1	SCM ^a	1	SCM
2		2	ASM
3	Service Modules ^b	3	ASM
4		4	ASM
5		5	NSM
6		6	NSM

Table 3.1 ARX®6000 Chassis Configurations

Basic System		Maximum Capacity		
Slot	Module	Slot Module		
Utility Bay				
2 disk drives: D1, D2 2 disk drive		2 disk drives:	D1, D2	
2 power supplies		2 power supp	2 power supplies: PS1, PS2	

Table 3.1 ARX®6000 Chassis Configurations

a. The SCM always uses slot 1.

b.Service modules may use any of slots 2–6. For in-chassis high availability, redundant modules are installed in adjacent slots, for example, ASMs in slots 3 and 4, and NSMs in slots 5 and 6.

Redundant Pairs

You can purchase two ARX®6000 switches and configure them as a redundant pair. If the primary switch fails, all services "fail over" to the secondary switch. This is a highly-available configuration.

The redundant switches are interconnected through one or more of their Gigabit Ethernet ports. You use the CLI to configure the ports for redundant-link traffic (as opposed to client/server traffic).

See the <u>ARX® CLI Network-Management Guide</u> and <u>ARX® CLI Reference</u> for information about configuring redundant switches.

If you are installing the second switch in a redundant pair, there are differences in the initial-boot procedure. The differences are outlined later in Chapter 7. *Connecting the Switch to the Network*.

Resilient Overlay Network (RON)

You can connect multiple ARX^{\otimes} es together in a Resilient Overlay Network (RON). A RON is composed of a series of IP tunnels between the switches. You can use the CLI to configure a RON tunnel, as described in the CLI manuals.

See the <u>ARX® CLI Network-Management Guide</u> and <u>ARX® CLI Reference</u> for information about configuring RON tunnels.



Hardware Modules

This chapter describes the switch modules, including their hardware features, functions, and front panel interfaces. For information about module connectors and pinout assignments, see <u>Appendix A, Cable Connectors</u>.

 $ARX^{\scriptsize{\circledR}}6000$ modules include the following management and service modules:

- System Control Module (SCM)
- Adaptive Services Module (ASM)
- Network Services Module (NSM)

System Control Module (SCM)

The System Control Module (SCM) provides the management and control functions for the other modules in the chassis. The SCM communicates with the slots in the chassis over a system status bus, which enables the SCM to manage, monitor, and control module activity. The SCM also provides switch fabric functionality in the chassis.

Alert and Status LEDs

(See Chapter 8 for LED information.)

10/100 Ethernet management port (RJ-45)

Mirror port (RS-232)

Serial console port (RJ-45)

Link status LEDs

Figure 4.1 SCM Front Panel

Features

The SCM provides or supports the following features and functions:

Switch Fabric

- Non-blocking architecture for 40-Gbps full duplex non-blocking aggregate throughput
- 10-Gbps full duplex throughput for each service module slot
- Switch control-plane and data-plane functions
- 9K jumbo frames

Chassis Management

- RS232/Console serial interface for local switch management
- 10/100 Management Ethernet interface for local/remote switch management
- Mirror port for monitoring and troubleshooting user ports
- Service definition and policy enforcement
- MAC-address assignment for modules
- · Real-time clock synchronization for modules
- Gathering and monitoring of module health status and statistics through LEDs and software
- · Module insertion/removal in a slot

Environmental Control and Management

The SCM also manages or monitors the following functions:

- · Temperature changes in the chassis and for each module
- Module resets (for example, if a module's temperature gets too high) or power-down operation
- · Power draw for each module
- Fan tray control interface

Dual-Channel SCM

The SCM's dual-channel bus architecture enables it to communicate over two separate buses to the system disk drives. This configuration provides an additional level of redundancy by providing a second SCSI bus and permits each SCSI drive to be connected to the SCM in slot 1. For more information about the SCM and its bus interconnections, see <u>Disk Drives</u>, on page 3-4.

Adaptive Services Module (ASM)

The Adaptive Services Module (ASM) provides the core distributed filer functions for the switch. The ASM module has no external ports. It does provide external Alert and Status LEDs on the front panel.

Features

The ASM provides or supports the following features and functions:

- Virtual distribution of file services for NFS v2/v3 and CIFS protocols
- Dynamic adapting of the directory structure of back-end filers based on data management policies
- Back-end file storage device (NAS and DAS) aggregation
- · Namespace and volume management

Network Services Module (NSM)

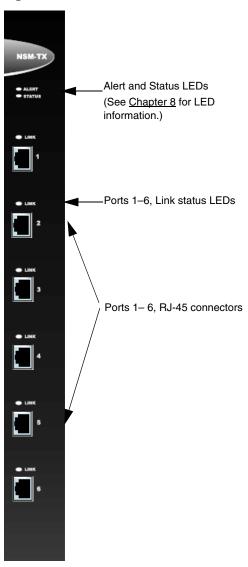
The Network Services Module (NSM) provides network connectivity and supports load balancing, resource switching, Fast Path, and VPN terminations for the switch. Two standard versions are available:

- NSM-TX 6-port copper connections
- NSM-FX 6-port fiber-optic connections, multi-mode

NSM-TX

 $\underline{\text{Figure 4.2}}$ shows the NSM-TX module front panel, which provides six RJ-45 connections.

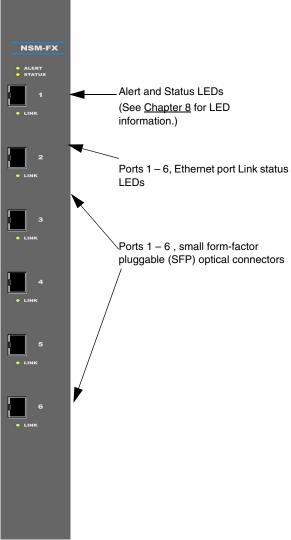
Figure 4.2 NSM-TX Front Panel



NSM-FX

<u>Figure 4.3</u> shows the NSM -FX module front panel, which provides six small form-factor pluggable (SFP) optical connectors, 850nm multi-mode. These connectors can reach distances up to 500m over 50/125um MMF.

Figure 4.3 NSM-FX Front Panel



Features

The NSM provides or supports the following features and functions:

- Network connectivity
- Auto-negotiation for 100/1000 Ethernet transmission
- Standard Ethernet and jumbo-frame (9K) packet sizes

- Full-duplex switching at line rates for Layer 2 processing
- Low latency, store and forward switching, with built-in multicast support
- Resource switching
- Network File System (NFS) fast path
- Common Internet File System (CIFS) fast path
- NFS-client connection aggregation to direct network-attached storage (NAS)



System Specifications

This chapter describes technical system specifications, power requirements, and cable requirements for the $ARX^{\text{(8)}}$ and its components. This chapter also describes regulatory information.

Topics include:

- System Specifications
- System Power Requirements
- Power Cord and Cable Requirements
- Regulatory Compliance
- FCC Compliance

See Appendix A for cable-connector diagrams and pinouts.

System Specifications

<u>Table 5.1</u> describes the ARX® system specifications.

Component	Specification
Chassis Dimensions (includes fan tray and front bezel)	Height: 22.75 in. Width: 19.00 in. (including the fixed mounting ears) Depth: 23.00 in.
Chassis Weight (includes fan tray, 2 disk drives, 1 power supply, 3 modules)	150 lb (68.04 kg)
Chassis / Power Supply	Altitude: -200 ft. (-60 m) min. to 8000 ft. (2500 m) max.
Environmental Requirements	Humidity — Operating: 5 % min. to 95% max. (non condensing) Storage: 5% to 95%
	Temperature — Operating: 32 deg. to 104 deg. F (0 deg. to 40 deg. C) Storage: -40 deg. to 149 deg. F (-20 deg. to 65 deg. C)
Power Supply Power	Input voltage: 220 Vac Output voltage: -48 Vdc 3000 W maximum total DC power per chassis (Note: only 1500 W power is used; the 3000 W accounts for redundant power supplies. Due to the 88% efficiency of the drives, 1704 W input is required to achieve the maximum 1500 W output.)
Fan Tray Dimensions (includes outer bezel)	Height: 4.88 in. (12.40 cm) Width: 17.25 in. (43.82 cm) Depth: 18 in. (45.72 cm)
Fan Tray Power	Input voltage: 48 Vdc (6 fans) Max. input current: 4 A
Airflow Clearance	Minimum clearance of 12 inches (30.48 cm) required for air intake from bottom front of chassis and exit through the top back (and side) of chassis to maintain proper venting and prevent overheating.
Air Filter	Height: 0.25 in. (0.635 cm) Width: 11 in. (27.94 cm) Depth: 20 in. (50.8 cm)

Table 5.1 System and Module Specifications

Component	Specification
Hardware module dimensions (SCM, ASM, NSM)	Height: 15.25 in. (38.74 cm) Width: 1.75 in. (4.45 cm) Depth: 20 in. (50.8 cm)
Hardware module power (SCM, ASM, NSM) (See <u>Table 5.2</u> for power consumption information.)	Input voltage: -48 Vdc

 Table 5.1 System and Module Specifications (Continued)

System Power Requirements

The ARX®6000 chassis uses one or two power supplies. When two power supplies are installed, the power load is shared. The power supplies require a 20 A/220 Vac input cord, which is provided with the chassis. The AC outlet to the switch must be properly grounded.

<u>Table 5.2</u> lists the system (fan tray and modules) power consumption.

Component	Power (Watts)		
	Typical	Maximum	
System Control Module (SCM)	160 W	179 W	
Network Services Module (NSM)	125 W	137 W	
Adaptive Services Module (ASM)	210 W	237 W	
Fan Tray (6 fans + fan controller)	105 W	176 W	

Table 5.2 Module Power Consumption

The total power dissipated by the chassis is the sum of all of the above divided by 0.88 (the power supply runs at 88% efficiency). Specifically,

$$\frac{(1 \times SCMpwr) + (n \times ASMpwr) + (m \times NSMpwr) + (1 \times fans)}{0.88}$$

Where

n is the number of installed ASMs

m is the number of installed NSMs

The division by 0.88 accounts for the 88% efficiency of the power supply.

If you want to plan for future expansion, you can budget for a total of 1704 Watts power dissipation. This is equivalent to 5812 BTUs/hour.

Power Cord and Cable Requirements

<u>Table 5.3</u> lists the required cables and power cords for the switch. All cables *except* the AC power cord and console cable are customer-supplied.

Qty.	Cable/Cord	Used on	Specification
1 per power supply	AC power cord	AC/DC Power Supply	L6-20 type connectors for systems rated at 20 A/220 Vac
1	Console cable with RJ-45-to-DB9 adapter	Console port	100BASE-T Category 5 unshielded twisted pair (UTP); 24 AWG
2	Ethernet cables for connection to 10/100 Mbps Ethernet management port (RJ-45 connector);	System Control Module (SCM) MGMT port Mirror port	
6 per NSM	Ethernet cables for connection to 100/1000 Mbps Ethernet. (RJ-45 connectors)	6-port Network Services Module (NSM) (copper version)	^a 100/1000BASE-T Category 5/6, unshielded twisted pair (UTP) cable; 24 AWG
6 per NSM	Fiber-optic cable for connection to 1-Gbps Ethernet. small form-factor pluggable (SFP) optical connectors	6-port NSM (optical version)	100BASE-FX (fast Ethernet)/ 1000BASE-SX (Gigabit Ethernet), 850nm. Short-reach multi-mode fiber (MMF) with duplex LC-style connectors. Distances up to 500m on 50/125um MMF, or 300m on 62.5/125um MMF.

Table 5.3 Required Power and Data Cables

a.NSM Gigabit Ethernet ports support automatic MDI/MDIX cross-over. This feature automatically corrects the polarity of the attached CAT5 cable, regardless if it is a cross-over or straight-through type. However, for this feature to work, the port speed must be set to auto (auto-negotiate) through the CLI. When the port speed/duplex is forced (auto-negotiate is disabled), automatic MDI/MDIX cross-over is disabled, and you must cable the port using standard cross-over or straight-through cabling.

See Appendix A for cable-connector diagrams and pinouts.

Regulatory Compliance

The ARX®6000 switch complies with the following agency requirements:

Category	Compliance
Safety	UL 60950 cUL listed to CSA C22.2 No. 950 IEC950 (EN60950) CE Marking
Emissions	FCC Part 15 Class A CISPR22 Class A (EN55022) CE Marking EN 55024 VCCI Class A

FCC Compliance



This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Changes or modifications not expressly approved by the manufacturer could void the user's FCC granted authority to operate this equipment.



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



Unpacking and Installing the Chassis

This chapter describes the following topics and tasks:

- Safety Instructions
- Required Tools and Equipment
- Verifying Shipment
- Unpacking the Chassis
- Removing the Fan Tray
- Rack-Mounting the Chassis
- Installing the Front Bezels
- Attaching the Power Cords
- Powering Up the Chassis
- Cabling the Modules
- Air Filter and Cable Management

Safety Instructions

Observe the following safety guidelines to avoid personal injury or damage to equipment when installing or operating the switch:

DANGER

The chassis is both heavy and difficult to maneuver. Two or more people are required to move and lift the chassis.

DANGER

Never assume that power is disconnected from a circuit; always check.

Before installing the switch, locate the power ON/OFF toggle on the back of the chassis and make sure it is set to OFF.

Disconnect any power or external cables before moving a chassis.

A chassis configured with two power supplies has two power cords. In the event that AC power must be removed from the system, disconnect both power cords before servicing the unit to avoid electric shock.

Required Tools and Equipment

The following equipment is required/recommended for unpacking, rack-mounting, and installing the chassis:

- pallet jack or handcart
- Wire cutter/utility knife
- · Rack-mount screws
- #2 Phillips screwdriver
- · Flat-head screwdriver
- Data cables (see *Power Cord and Cable Requirements*, on page 5-5)
- Customer-supplied standard 19-inch EIA rack
- Antistatic wrist straps for handling modules

Verifying Shipment

The ARX®6000 shipment includes:

- · Chassis and hardware components
- Accessory kit

Check the contents of the shipping crate and any additional boxes to verify complete shipment. <u>Table 6.1</u> lists the contents you should receive.

Box/Crate	Contents
Chassis	ARX [®] 6000 chassis with installed components: fan tray, modules, two power supplies, two disk drives, air filter/cable guide
Accessory Kit	Front bezels (cover fan tray and utility bay) 2 20A 250V power cords Console cable (8 ft.) with RJ-45-to-DB9 adapter Keys for unlocking disk drives Air-filter front panel/cable guide ARX®6000 rack-mount-alignment template (long, white stickers) ARX®6000 Quick Installation card ARX®6000 Hardware Installation Guide (this manual)

Table 6.1 Verify Shipping-Crate Contents

Unpacking the Chassis

The chassis is shipped with all ordered components installed. The chassis shipping carton is attached to a reinforced pallet for easy transfer (using a handcart or pallet jack) to the installation site. The accessory kit is packaged with the chassis.



Figure 6.1 Chassis Shipping Carton

Unpack the chassis as follows:

1. Using a handcart or pallet jack, move the shipping carton to the installation site.

DANGER

With packaging, a minimally-configured chassis weighs approximately 163 lb (150 lb without packaging). Two or more people are required to move, lift, and rack-mount the chassis.

- 2. Before unpacking the chassis, inspect the carton for any shipping damage.
- 3. Using a wire cutter, cut and remove the package strapping from the shipping carton.
- 4. Remove the carton top cover and open the box.

- 5. Remove the small box inside. This contains the accessories described in <u>Table 6.1</u>.
- 6. Slowly slide/lift the outer carton up and away from around the chassis, which sits in foam packaging on the pallet.
- 7. Remove the foam packaging from the bottom front and back of the chassis.



Before you install the chassis into a rack, it is *recommended* that you remove the fan tray and power supplies to facilitate handling and ease rack-mounting. These components are particularly heavy. You can replace these units after the chassis is secured in the rack, as shown in the next section.

Removing the Fan Tray

The fan tray is accessible from the front of the chassis. It is located at the top of the switch.

1. Loosen the captive screws on either side of the fan tray, grasp the handle, and slowly pull the fan tray toward you (see <u>Figure 6.2</u>).

Figure 6.2 Removing Fan Tray



2. Carefully slide the fan tray out of the top of the chassis and set aside.

Removing the Power Supplies

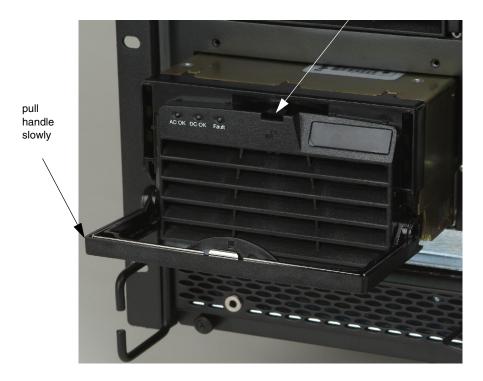
The chassis contains two power supplies that are accessible from the front panel. The top power supply is called power supply "A" in the CLI's show chassis chassinfo command. The bottom power supply is power supply "B."

Power Supply A (the top one) corresponds to the power plug labeled "Primary" on the back panel. Power Supply B corresponds to the plug labeled "Redundant" on the back panel.

1. In the utility bay, remove a power supply by carefully inserting a flat-head screwdriver into the center notch and pulling up and out. The power supply handle will release toward you.

Figure 6.3 Removing the Power Supply

handle-release notch



WARNING

Do not put excessive strain on the handle. Do not lift or carry the power supply by its handle.

- 2. Carefully slide the power supply out of the bay and set aside.
- 3. If there is a redundant power supply, repeat these steps to remove the other power supply.

Rack-Mounting the Chassis

An EAI standard rack has holes that you must align with the holes in the chassis flange. A set of $ARX^{\otimes}6000$ rack-mount-alignment templates are included in the accessory kit to help with this alignment. These are long, white stickers with holes in the same pattern as the chassis flange. Line them up with the holes in the rack to create a visual target for the chassis.

With one person in the front of the chassis and another at the back, carefully lift the chassis into the rack and align the six holes on each side of the chassis (flange edges) with the holes in the rack. See <u>Figure 6.4</u>. Use the alignment templates as a guide.

Figure 6.4 Aligning Chassis Flange with Rack

Align chassis flanges with rack - secure with 6 screws on each side



- 1. Insert 1-inch (2.5 cm) Phillips-head screws (six on each side) through the holes and tighten securely.
- 2. When the chassis is secured in the rack, replace the fan tray and power supply (or power supplies). Reverse the steps in *Removing* the Fan Tray, on page 6-7 and *Removing the Power Supplies*, on page 6-7.

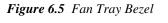
Installing the Front Bezels

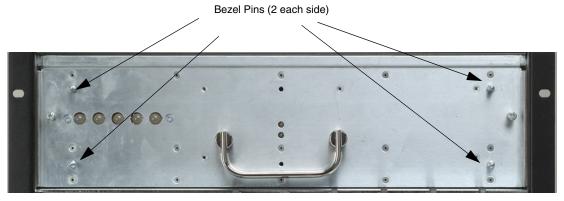
After you have reinstalled the fan tray and power supplies in the chassis, you can install the front bezels over the fan tray and utility bay. The bezels are shipped in the accessory kit.

Fan Tray

To install the bezel over the fan tray:

1. Align the clips (on back of bezel) with the pins on the fan tray.

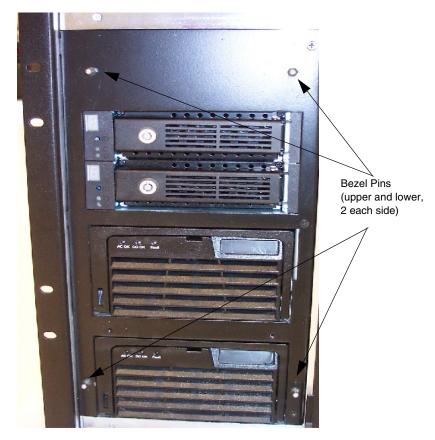




2. Using two hands, gently press the bezel squarely onto the pins until the bezel clicks into place over the fan tray.

Utility Bay

1. Align the bezel over the utility bay, holding the bezel by the indentation on the left side for an easier grip.



2. Align the clips (on back of bezel) with the pins at the top and bottom on the utility bay.

3. Gently push the bezel down over the pins until it clicks into place top and bottom.

Attaching the Power Cords

To attach the AC power cords to the chassis:

- 1. Locate the power ON/OFF toggle switches on the back of the chassis and ensure they are set to the OFF position.
- 2. For a chassis with only one power supply, attach the power cord to the *right* plug.
- 3. For a chassis with two power supplies, attach a power cord to each plug.

The right plug, labeled "Primary," connects to the top power supply. This is called power supply "A" in the CLI's show chassis command. The left plug, labeled "Redundant," connects to the bottom power supply. The bottom power supply is power supply "B."

DANGER

A chassis configured with two power supplies has two power cords. In the event that AC power must be removed from the system, disconnect both power cords before servicing the unit. Otherwise, there is a risk of electric shock.

Figure 6.6 Power Switch and Connections
For chassis with a single power supply, use the right power plug



See <u>Power Cord and Cable Requirements</u>, on page 5-5 for power cord and cable specifications.

Powering Up the Chassis



The switch requires a dedicated 20A circuit for each AC/DC power supply.

WARNING

Before applying power, ensure that the AC outlet to the switch is properly grounded.

To power up the chassis, find both ON/OFF toggle switches on the back panel. Flip both switches to the ON position.

The switch boot wizard runs automatically at switch start-up. See the sections, *Connecting the Console Terminal*, on page 7-3 and *Booting the Switch*, on page 7-4 for information.

Once initial boot-up has occurred, the fan speed automatically regulates for the appropriate cooling requirement based on ambient temperature.

Cabling the Modules

You can cable the modules before or after the switch is connected to the network. For console connection and switch-boot information, see Chapter 7, Connecting the Switch to the Network.

Module cables (except the console cable) are supplied by the customer. For cable specifications and requirements for each of the module types, see Power Cord and Cable Requirements, on page 5-5. describes cable connector and pinout information.

Air Filter and Cable Management

Captive Screw

The chassis is shipped with the air filter installed. The accessory kit contains the air filter panel/cable guide which covers the air filter tray and provides guides at each end for cable management.

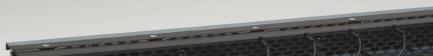


Figure 6.7 Cable Guide



Captive Screw

<u>Figure 6.8</u> shows the air filter and cable guide location on the bottom front of the chassis.

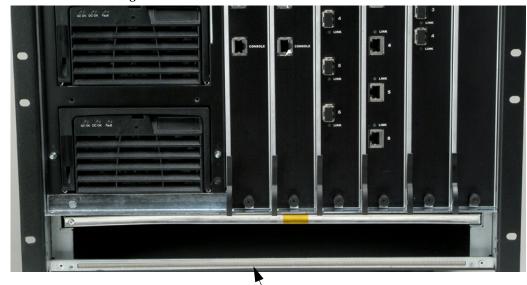


Figure 6.8 Air Filter/Cable Guide Location

Air filter and cable guide location

Installing the Air-Filter Panel and Cable Guide



Customers are required to maintain the switch's air filter at regular intervals. Failure to do so may damage the switch.

To install the air-filter panel/cable guide:

- 1. Remove the air-filter front panel/cable guide from the accessory kit.
- 2. Remove the tape from the air filter opening and verify the air filter is seated properly in the chassis.
- 3. Insert the cable guide into the opening, aligning the captive screws on either side with the holes in the chassis.
- 4. Hold one side while tightening the screw on the opposite side; then tighten the other screw to secure the cable guide in place.



Connecting the Switch to the Network

This chapter describes how to connect the ARX® to a console terminal and boot the switch for the first time.

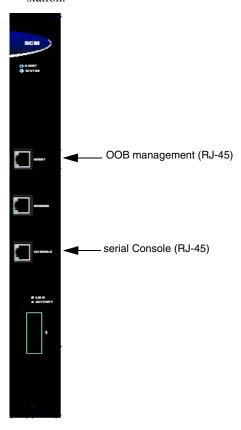
Topics and tasks include:

- Management Interfaces
- Connecting the Console Terminal
- Booting the Switch
- Connecting the Ethernet Management Port

Management Interfaces

The System Control Module (SCM) provides the following management ports:

- Console a serial Console port for connecting a console terminal, and
- MGMT a 10/100 Ethernet port for an out-of-band (OOB) management station



During the initial-boot process described in this chapter, you can only access the serial Console port. You configure the OOB management port ("MGMT") as part of the procedures in this chapter.

Connecting the Console Terminal

Set the following console-terminal parameters to match those on the SCM's Console port:

- 9600 baud rate (default)
- · XON-XOFF flow control
- 8 data bits
- 1 stop bit, no parity

Connect the console terminal to the serial Console port (RJ-45) on the SCM. An RJ-45 to DB9 adapter is included in the installation kit if you want to connect to your management station's serial DB9 port.

Booting the Switch

The *initial-boot script* runs automatically at switch start-up. It prompts for basic configuration and security information required to access the switch and manage it remotely.

At the console terminal, boot the switch as follows:

1. Power-on the switch (as shown in *Powering Up the Chassis*, on page 6-12). After some boot-up messages, the following prompt appears:

Press <Enter> to start the Switch Configuration Wizard.

2. Press **<Enter>** as prompted.

Several questions appear, prompting you for basic network information (such as management-IP address, mask, and gateway). These questions comprise the initial-boot script. Answer these questions as they come up. Examples and instructions appear in the subsections below.

Sample: Booting a Non-Replacement Switch

This sample shows the simplest initial-boot scenario, for a new (non-replacement) switch that is either standalone or the *first* member of a redundant pair. The sample answers are not necessarily appropriate to the following scenarios:

- this replaces a defunct switch,
- this will join a running switch as its redundant peer, or
- this switch is being re-installed after F5 personnel performed a "Manufacturing Installation" on a previously-running switch.

Later sections discuss these contingencies and how to handle each of them. The answers below apply to the simplest case only. Sample answers are shown in bold text:

F5 ARX Switch Startup

This F5 ARX switch does not currently have critical system information programmed. The following wizard prompts you for this information. You can connect to the switch through the out-of-band management interface when you finish.

To restart the configuration program, enter 'r' at any prompt.

Acknowledge acceptance of the following terms and conditions

by entering 'yes' at the next question.
1. Press <Enter> to continue. # <Enter>

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LICENSEE AGREES TO BE BOUND BY THE TERMS OF THIS AGREEMENT BY INSTALLING, HAVING INSTALLED, COPYING, OR OTHERWISE USING THE PRODUCT. IF LICENSEE DOES NOT AGREE, DO NOT INSTALL OR USE THE PRODUCT.

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- Enter 'yes' to accept these terms and conditions in the format 'yes' or 'no'. # yes

The switch's management port requires an IP address and mask.

- 3. Enter the management port IP address
 - in the format nnn.nnn.nnn or 'none'. # 10.1.27.69
- 4. Enter the management port subnet mask in the format nnn.nnn.nnn.(default=255.0.0.0) # 255.255.255.0

The switch's management port requires a gateway IP address.

5. Enter the gateway IP address for the management interface in the format nnn.nnn.nnn or 'none'.(default=10.1.1.1) # 10.1.27.1

A switch replacement requires additional configuration questions.

6. Are you doing a switch replacement?
 in the format 'yes' or 'no'.(default=no) # no

The crypto-officer is the most privileged user in the system.

- 7. Enter the crypto-officer username
 - in the format text (1-28 characters). # admin
- 8. Enter the crypto-officer password in the format text (6-28 characters). # mypassword Confirm the system password # mypassword

A system password is required for access to the master key.

- 9. Enter a system password
 - in the format text (12-28 characters). # dOuble\$ecRET

 Confirm the system password # dOuble\$ecRET

The master key is used to encrypt critical security parameters.

- 10. Enter the master key
 - in the format base64-encoded key or keyword 'generate'.(default=generate) # <Enter>

The system displays a configuration summary, for example:

Configuration Summary

Management IP Address 10.1.27.69
Management IP Mask 255.255.25

Management Gateway 10.1.27.1

Power Configuration 220

Private IP Subnet 169.254.6.0
Private IP Mask 255.255.25.0

Private VLAN 1008 Private Metalog VLAN 1009

Chassis GUID 3d17e8ce-571e-11dc-9852-ef323fbb290f

Switch Password ######
Switch Master Key generate
Crypto-officer Username
Crypto-officer Password ######

Enter 'yes' to load configuration or 'r' to restart #yes

You have completed the switch startup configuration. The switch will now initialize the local database. When the login prompt appears, log into the switch using the crypto-officer's username and password.

Closing configuration file.
Processing configuration file. (boot-config)

. . .

The boot-up prompts continue until you reach the "Username" prompt. Confirm that an administrator can log in by using the Crypto-Officer username and password that you entered in the initial-boot script. For example:

• • •

User Access Authentication

Username: admin
Password: mypassword

SWITCH>

The switch is now ready for configuration through the GUI or the CLI. See the <u>ARX® GUI Quick Start: Network Setup</u> manual for instructions on using the GUI to set up network parameters, or the <u>ARX® CLI</u> <u>Network-Management Guide</u> for detailed network-configuration instructions.

Preparing for Switch Replacement

For switch replacement, the process detailed previously becomes more complicated.

You can replace a single switch or a switch that is a member of a redundant pair. The interview that runs during installation is the same regardless of the type of replacement. For a single switch replacement, there are a few things you must have done prior to the switch failing. This includes saving your running and global configs, UUID, and master key and associated passwords as described in the *ARX*® *Site Planning Guide*, <u>Best Practice</u>: <u>Regularly Saving the Configuration</u>, on page 1-62. The only other

differences between replacing a single switch and replacing a member of a redundant pair is that for a single switch, a re-import is required at the appropriate point during configuration. Since with a single switch installation, the configuration is not saved on a backup switch, you have to manage what you do with these key pieces of configuration data *prior* to the switch's failing.

Before You Begin: Verifying Hardware Compatibility

The replacement switch's hardware must match that of the failed switch. At the end of the switch replacement, you will run the failed switch's running-config on the replacement switch. The running-config includes slot numbers for the modules, so the new switch must have its modules in the same slots as its predecessor. Before you begin the replacement process, verify that the replacement switch has all of its ASMs and NSMs in the same positions as the failed switch.

Choosing Switch Replacement

The initial-boot script asks if this is a switch replacement. Answer **yes** to invoke the questions that are required to replace the failed switch. For example,

```
A switch replacement requires additional configuration questions.

6. Are you doing a switch replacement?
  in the format 'yes' or 'no'.(default=no) # yes
```

Matching the Private Subnet

The next set of questions ask for the switch's *private subnet*, the *private VLAN* for that subnet, and the VLAN for a private *metalog subnet*. If the failed switch was in a redundant pair and/or RON network, the private subnets of the replacement switch should match those of the switch that failed. Each ARX® uses its private subnet for communication with other ARX®es in the same Resilient-Overlay Network (RON) and/or the switch's redundant peer. All private subnets in the RON and/or pair are carried by the same VLAN. This private VLAN, and the separate metalog VLAN, must be reserved for ARX® traffic only.

The private-subnet and VLAN information appears at the top of a the failed switch's show running-config output. For example, this is the top of a running-config file from a failed switch. The private-subnet information is highlighted in bold text:

```
vlan 81
```

Entering the Private Subnet

Enter the private subnet and VLAN of the failed switch, as well as the VLAN for the private metalog subnet. The VLANs must be unique in your network, shared only amongst the ARX®es in the RON. The defaults (1002 and 1003) may be sufficient for your installation. For example:

```
The switch's internal subnet requires an IP address and mask.

7. Enter the switch's private IP address in the format nnn.nnn.nnn.(default=169.254.6.0) # 169.254.17.0

8. Enter the switch's private subnet mask in the format nnn.nnn.nnn.(default=255.255.255.0) # <Enter>

The private subnet VLAN is used externally for redundancy traffic. Be sure this value does not conflict with existing VLAN IDs.

9. Enter the chassis's private subnet VLAN in the format integer [1-4095].(default=1002) # 1008 <Enter>

The private subnet metalog VLAN is used for storing file-change logs on battery-backed NVRAM, possibly on a redundant peer. Be sure this value does not conflict with existing VLAN IDs.

10. Enter the chassis's private subnet metalog VLAN in the format integer [1-4095].(default=1003) # 1009 <Enter>
```

Finding the UUID of the Failed Switch

When a switch imports storage from back-end filers, it marks each share with its Universally-Unique ID (UUID). A replacement switch must use the same UUID or it rejects all of the shares used by its predecessor. You also need to set the UUID if the switch is brought back to its factory defaults; a "Manufacturing Installation" by F5 personnel resets the switch and its UUID.

The UUID appears at the top of a switch's show running-config output. For example, this is the top of a running-config file from a switch named "minturnA." The UUID is highlighted in bold text:

If the failed switch was a member of a RON, you can alternatively use show ron from any other RON member. This shows the UUID even if the chassis is no longer online. For example, the following command (run on another switch in the RON) shows the UUID for the same failed chassis, "minturnA." Again, the UUID is highlighted in bold text:

prtlndA(cfg)# show ron

Switch Name	HA Peer Switch	Uptime
Status	UUID	Management Addr
bstnA	(None)	0 days, 02:07:57
ONLINE	d9bdece8-9866-11d8-91e3-f48e42637d58	10.1.1.7
gffstnA	(None)	0 days, 01:59:42
ONLINE	e5d870ae-571e-1352-916b-ef324fbc05a2	10.1.49.60
minturnA	(None)	0 days, 02:00:16
OFFLINE	3d17e8ce-571e-11dc-9852-ef323fbb290f	10.1.27.69
provA	(None)	0 days, 02:08:11
ONLINE	db922942-876f-11d8-9110-8dtu78fc8329	10.1.38.19
prtlndA	prtlndB	0 days, 02:07:59
ONLINE	876616f6-79ac-11d8-946f-958fcb4e6e35	10.1.23.11
prtlndB	prtlndA	0 days, 00:18:55
ONLINE	64dcab94-a2b6-11d8-9d25-bf2c991c83f9	10.1.23.12

prtlndA(cfg)# ...

Applying the UUID

The next prompt in the initial-boot script asks for the UUID. Enter the UUID of the failed switch. For example,

. .

The UUID should only be entered if this chassis is replacing a failed chassis and the entered UUID should match the UUID of the failed chassis.

11. Enter the chassis's UUID

in the format

. . .



No two running chassis should ever share the same UUID. Only enter the UUID in a switch-replacement scenario.

Installing a Redundant Peer or Cluster

If you are installing the second switch in a redundant pair (called an ARX cluster) or if you are configuring a second ARX cluster in a Disaster Recovery (DR) configuration, you need to provide additional information to the initial-boot script. All members of the cluster share a common master key.



A master key is an encryption key for all critical-security parameters (CSPs), such as administrative passwords.

Redundant switches must use the same master key because they share the same users, groups, and passwords. In the case of of a DR configuration, all four ARXs must be configured with a common master key.

At the switch that is currently installed, use the show master-key command to create an encrypted copy of the master key.

The CLI prompts you for two passwords:

- System Password is a password entered at initial-boot time (see <u>Sample:</u> <u>Booting a Non-Replacement Switch</u>, on page 7-4). It is 12-32 characters long. This validates that you have permission to access the master key.
- Wrapping Password is set with this command. The security software uses this to encrypt (and later decrypt) the master-key string.

Enter 12-32 characters. At least one character in this password must be a number (0-9) or a symbol (!, @, #, \$, and so on).

Save this password: you will need it to decrypt the master key later, on the new switch.

This command outputs a base64-encoded string that is the encrypted master key. Save this string *and* the wrapping password that you set in the command.

For example, this shows the master key on a switch named "minturnB:"
minturnB# show master-key
Master Key System Password: %uper\$ecretpw
Wrapping Password: anOther\$ecretpw
Validate Wrapping Password: anOther\$ecretpw
Encrypted master key:

2oftVCwAAAAgAAAApwazSRFd2ww/H1pi7R7JMDZ9SoIg4WGA/XsZP+HcXjsIAAAADDRbM CxE/bc= minturnB# ...

Applying the Master Key

As shown in an example earlier, there is a prompt for the master key in the initial-boot script. You can answer this prompt with the encrypted master key; the script then prompts for the wrapping password. For example,

Sample: Replacing a Redundant Peer

This sample script uses the private subnet, the UUID, and the master key to replace a failed peer.

F5 ARX Switch Startup

This F5 ARX switch does not currently have critical system information programmed. The following wizard prompts you for this information. You can connect to the switch through the out-of-band management interface when you finish.

To restart the configuration program, enter 'r' at any prompt.

Acknowledge acceptance of the following terms and conditions by entering 'yes' at the next question.

1. Press <Enter> to continue. # <Enter>

LICENSE AGREEMENT

. . .

Enter 'yes' to accept these terms and conditions in the format 'yes' or 'no'. # yes

The switch's management port requires an IP address and mask.

- 3. Enter the management port IP address
 - in the format nnn.nnn.nnn or 'none'. # 10.1.27.69
- 4. Enter the management port subnet mask

in the format nnn.nnn.nnn.nnn.(default=255.0.0.0) # 255.255.255.0

The switch's management port requires a gateway IP address.

5. Enter the gateway IP address for the management interface in the format nnn.nnn.nnn or 'none'.(default=10.1.1.1) # 10.1.27.1

This next question invokes the questions for switch replacement:

A switch replacement requires additional configuration questions.

6. Are you doing a switch replacement? in the format 'yes' or 'no'.(default=no) # yes

- The switch's internal subnet requires an IP address and mask.

 7. Enter the switch's private IP address in the format nnn.nnn.nnn.(default=169.254.11.0) # 169.254.17.0
- 8. Enter the switch's private subnet mask
 in the format nnn.nnn.nnn.(default=255.255.255.0) # <Enter>

The private subnet VLAN is used externally for redundancy traffic. Be sure this value does not conflict with existing VLAN IDs.

9. Enter the chassis's private subnet VLAN
 in the format integer [1-4095].(default=1002) # 1008 <Enter>

The private subnet metalog VLAN is used for storing file-change logs on battery-backed NVRAM, possibly on a redundant peer. Be sure this value does not conflict with existing VLAN IDs.

10. Enter the chassis's private subnet metalog VLAN

```
in the format integer [1-4095].(default=1003) # 1009 <Enter>
The UUID should only be entered if this chassis is replacing a failed chassis
  and the entered UUID should match the UUID of the failed chassis.
11. Enter the chassis's UUID
  in the format
3d17e8ce-571e-11dc-9852-ef323fbb290f
The crypto-officer is the most privileged user in the system.
12. Enter the crypto-officer username
  in the format text (1-28 characters).(default=admin) # admin
13. Enter the crypto-officer password
  in the format text (6-28 characters). # mypassword
        Confirm the system password # mypassword
A system password is required for access to the master key.
14. Enter a system password
  in the format text (12-28 characters). # dOuble$ecRET
        Confirm the system password # double$ecRET
                           This is the master-key question, where you use the encrypted master key and
                           the wrapping password from the redundant peer:
The master key is used to encrypt critical security parameters.
15. Enter the master key
  in the format base64-encoded key or keyword 'generate'.(default=generate) #
2oftVCwAAAAgAAAApwazSRFd2ww/H1pi7R7JMDZ9SoIg4WGA/XsZP+HcXjsIAAAADDRbMCxE/bc=
The wrapping password in use to encrypt and decrypt the master key.
16. Enter the wrapping password
  in the format text (6-28 characters). # anOther$ecretpw
        Confirm the wrapping password # an0ther$ecretpw
Configuration Summary
   Management IP Address
                           10.1.27.69
   Management IP Mask
                           255.255.255.0
                           10.1.27.1
   Management Gateway
   Power Configuration
                           220
   Private IP Subnet
                           169.254.17.0
   Private IP Mask
                           255.255.255.0
                           1008
   Private VLAN
   Private Metalog VLAN
                           1009
   Chassis GUID
                           3d17e8ce-571e-11dc-9852-ef323fbb290f
                            #######
   Switch Password
   Switch Master Key 2oftVCwAAAAgAAAApwazSRFd2ww/H1pi7R7JMDZ9SoIg4WGA/XsZP+HcXjsIAAAADDRbMCxE/bc=
                            #######
   Wrapping Password
   Crypto-officer Username admin
   Crypto-officer Password ######
Enter 'yes' to load configuration or 'r' to restart #yes
You have completed the switch startup configuration.
The switch will now initialize the local database.
When the login prompt appears, log into the switch using
the crypto-officer's username and password.
```

```
Closing configuration file.
Processing configuration file. (boot-config)
User Access Authentication
Username: admin
Password: mypassword
SWITCH>
                         The switch is now ready for configuration through the GUI or CLI.
                          To join it with its redundant peer, you can use the standard practice of
                          copying and applying the failed switch's running config:
SWTTCH> enable
SWITCH# copy ftp://juser:jpasswd@ftp.wwmed.com/feb6config scripts running
SWITCH# show scripts
 scripts
                           Apr 12 17:45 2.1k
     running
SWITCH# run scripts running
                          The running-config script sets up all local parameters, such as the hostname
                         and the network settings
SWITCH#; ARX-6000
SWITCH#; Version 5.02.000.12535 (Feb 5 2010 18:16:05) [nbuilds]
SWITCH#; Database version: 502000.21
SWITCH#; Generated running-config Sun Feb 14 01:44:06 2010
SWITCH#; System UUID 3d17e8ce-571e-11dc-9852-ef323fbb290f
SWITCH#; ip private vlan internal 1008 metalog 1009 subnet 169.254.17.0 255.255.25.0
SWITCH#; resource gateway 2
SWITCH#;
SWITCH#config
SWITCH# vlan 81
        description "personnel dept."
SWITCH#
SWITCH#
        members 4/1 to 4/1
         members 4/2 to 4/2
SWITCH#
SWITCH#
         exit
SWITCH#
SWITCH#...
SWITCH#config
SWITCH(cfg)# clock timezone America New_York
SWITCH(cfg)# hostname minturnA
minturnA(cfg)# ip domain-list wwmed.com
minturnA(cfg)# ...
minturnA(cfg)# exit
```

If you copied the private subnet and mask from the defunct switch, this completes the switch replacement. Otherwise, the new switch learns its private subnet from its peer, re-configures itself, and reboots. (A reboot is necessary to change the private subnet of an ARX®.)

See the <u>ARX® CLI Network-Management Guide</u> for detailed configuration instructions.

Connecting the Ethernet Management Port

After you boot the switch, you can connect the Ethernet out-of-band management port on the SCM to a management station or network. You can use this interface to access the Graphical User Interface (GUI) or the Command Line Interface (CLI). To access the GUI, direct a web browser to the interface over HTTPS (for example, "https://10.1.27.69/"). Use the crypto-officer username and password, entered above, to log in. For the CLI, use SSH with the interface and the crypto-officer username (for example, "ssh admin@10.1.27.69").

The $\underline{ARX}^{\circledcirc}$ $\underline{GUI\ Quick\ Start:\ Network\ Setup}$ manual contains instructions for getting started with the GUI, and the $\underline{ARX}^{\circledcirc}$ $\underline{CLI\ Network-Management}$ \underline{Guide} contains instructions and best practices for using the CLI to set up the ARX^{\circledcirc} .



Maintenance

This chapter addresses the ARX $^{\otimes}6000$ manual power-down sequence as well as describing the hardware power-on self-test (POST) diagnostics and module status indicators (LEDs) and their associated conditions.

- Powering Down the $\text{ARX}^{\text{\^{8}}}\text{6000}$
- POST Diagnostics
- LED Status Indicators

Powering Down the ARX 6000

The ARX®6000 requires a manual power-down sequence, which cuts power from all systems including the NVRAM. Once the NVRAM loses power from an external source, it uses a battery backup for up to 72 hours.

For details on powering down a single ARX® and a redundant pair, consult the *ARX*® *CLI Maintenance Guide*, <u>Powering Down the ARX</u>, on page 13-1. This prepares the ARX® pair for a planned power outage.

For power outages of greater than 72 hours, contact F5 Support.

POST Diagnostics

When the switch reboots and the modules power-up, POST (power-on self-test) diagnostics run on each module to verify their basic hardware integrity. You can view any hardware failures at the system console through the <u>show version</u> and <u>show chassis</u> commands. See the following sample output.

Figure 8.1 Show Version Sample

```
minturnA> show version
  Copyright (c) 2002-2010 by F5 Networks, Inc. All rights reserved.
Running Release
test1.rel: Version 5.02.000.12535 (Feb 5 2010 18:16:05) [nbuilds]
Armed Release
test1.rel: Version 5.02.000.12535 (Feb 5 2010 18:16:05) [nbuilds]
Backup Release
test2.rel: Version 5.02.000.12535 (Feb 5 2010 18:16:05) [nbuilds]
System Configuration: Version 502000.21
```

minturnA uptime is 0 weeks, 0 days, 1 hours, 25 minutes.

Slot	Admin	ModuleType	ModuleState	FW Upgrade
1	Enabled	SCM	Online	Disabled
2	Enabled	ASM	Online	Disabled
3	Enabled		Empty	Disabled
4	Enabled	NSM	Online	Disabled
5	Enabled		Empty	Disabled
6	Enabled		Empty	Disabled
Resour	ce	State		Forwarding
Switc	h	Up		Disabled

Figure 8.2 Show Chassis Sample

minturnA> show chassis

Identification: Hostname	UUID			
minturnA	3d17e8ce-571e-11dc-9852-ef323fbb290f			
Chassis: Chassis Type Model Number	HW Ver. Serial			
ARX-6000 ARX6	A 01 0216030011			
Private Subnet: VLAN Subnet Subnet Ma				
1008 169.254.17.0 255.255.2				
Chassis Environment: Base MAC Address Power	Fan(setting) Temperature			
00:0a:49:00:0b:00 Online Partial				
Power Details: Power State A Absent Logical Disk Details: Disk Status Veri	fication Mode Verification Rate			
1 Optimal Auto	matic 10 %			
	Transfer Rate Model			
Bay 1 68.50G Online Bay 2 68.50G Online	320MB/sec ATLAS10K4_73SCA 320MB/sec ATLAS10K4_73SCA			
RAID Controller Details: Rebuild Rate Max Transfer Rate Fi				
90 % 320MB/sec 1L				
	r Temperature NVR Battery Drive			
1 SCM Online Onli 2 ASM Online Onli 4 NSM Online Onli	ne Normal (<65 C) N/A			
Slot Ports Procs Card Xeon	Sibyte Serial			
1 1 1 SCM 2.0 GHz 2 0 2 ASM 2.4 GHz 4 6 6 NSM_TX N/A	4096 MB N/A 0307070293			

	MAC Addr				HW Ve			ork De	viatio	n	
1	000A4900 000A4900	0B09 to 0B15 to	000A49000 000A49000 000A49000	0B09 0B16	D 20 C 16						
	Reset CP	•									
	1 0	3 N/A									
4	13										
			Diag V								
1	2.03.000	.09144	3.01.00	00.107	31	3.01	1.000.3				
2 4	2.03.000 5.01.000	.09144	3.01.00 5.01.00	00.107 00.118	31 98	3.01 5.01	L.000.1 L.000.1	10731 11898			
			r Speed					-			
1		24	10 Gbps								
	67 67	N/A		20 N/A	1	.0 Gbp	os				
•		,		,							
Slot/	Media De 'Port T 				ndor 			Status			
Name								МВ			
Syste					 173		1401		1610		47%
Relea					285		2681		2335		54%
Logs	s; DiagIn	fo: List	ts		0037 458		56 162		28455 7866		1% 3%
Scrip		, 213			172		178		2833		6%
Repor	rts			8	458		33		7994		1%
Tempe	erature D										
Slot		Local		Local	Remo	te	Local	Remote	Loc	al Rem	ote
1		25	26	27			N/A	N/A	N/A	 N/A	
2	ASM	32	27		27		21			22	
4	NSM	28	57	30	49		24	49	N/A	N/A	
	Battery		te				e (MB)				
Good		No Erro			102						

LED Status Indicators

This section describes the system status LEDs and conditions, including:

- · Module LEDs
- Ethernet-port link-status LEDs (NSM and SCM)

- · Disk-drive LEDs
- · Fan tray LEDs

Module Status LEDs

Each module front panel provides the following LED status indicators:

ALERT — Illuminates *Red* to indicate an operational failure

STATUS — Illuminates *Green* or *Yellow* based on the current operational state

During various module operations, module LEDs display Green, Yellow, or Red with intermittent blinking patterns, depending on the state. When blinking, LEDs are on for a half second and off for a half second.

<u>Table 8.1</u> describes the LED colors and blinking patterns that describe the module's operational status. You can find more details on the Module State(s) from the output of the <u>show version</u>, <u>show processors</u>, or <u>show chassis</u> CLI commands.

ALERT	STATUS	Module State(s)
(Off)	Green	Online
Red	Green (Blinking)	Powering up and running all POST tests. This pattern persists until/unless all POST tests pass. If it persists indefinitely, POST tests must have failed. In the latter case, you may need to replace the module; module-replacement procedures appear in an appendix of this manual.
(Off)	Green (Blinking)	Boot: POST tests passed. The module is running internal diagnostics and then booting. Downloading: the module's processor's are downloading new software and/or firmware. This state only occurs for processors that need it, and it occurs after the "Init" state (below).
(Off)	Yellow (Blinking)	Init: the module is provisioning its processor(s).
(Off)	Yellow	Online Partial: at least one processor is online, at least one is not online yet. If the offline processor does not come up in 5 minutes, this changes to Failed Partial.
Red	Yellow	Failed Partial: at least one processor is online, but at least one other processor failed. You may need to replace the module, as described in an appendix of this manual.
Red	(Off)	Failed. You may need to replace the module, as described in an appendix of this manual.

Table 8.1 Module Operational States and LED Patterns

Ethernet-Port Link Status LEDs

MGMT Port on the SCM

The out-of-band management port on the System Control Module (SCM), labeled "MGMT," has two LEDs:

- Top Link-status LED: steady green indicates that the port is enabled and a link is established.
- Bottom Activity LED: blinking green indicates packet traffic.

Link LED for Each NSM Port

Each client/server port on the Network Services Module (NSM) has link-status LED labeled "Link." This has the same function as the Link-status LED on the MGMT port: steady green indicates that the port is enabled and a link is established. There is no Activity LED for the client/server ports.

The Link LED is over each Ethernet port in the NSM-TX, but it is *under* each Fibre port in the NSM-FX.

Disk Drive LEDs

The system disk drives provide three status LEDs:

- Red indicates Activity
- Green indicates Power
- Orange indicates Failure

Fan Tray LEDs

The fan-tray module front panel provides two status LEDs, ALERT (top) and STATUS (bottom). <u>Table 8.2</u> describes the fan tray LED indicators and associated conditions.

ALERT	STATUS	Condition
(Off)	Green	No failures.
(Off)	Yellow	Warning. This could indicate one of the following conditions: • Single-fan failure, • Temperature >50 degrees C, or • Temperature sensor open. Contact F5 Support; you may need to replace the entire fan tray, as described in an appendix of this manual.

Table 8.2 Fan Tray Status LEDs

Chapter 8 Maintenance

ALERT	STATUS	Condition
Red	Yellow	Multiple-fan failure. Replace the fan tray as described in the appendix.
Red	Green	SCM-to-fan tray communication failure. This indicates a failure of the fan controller in the fan tray. Replace the fan tray as described in the appendix.

 Table 8.2 Fan Tray Status LEDs (Continued)



A

Cable Connectors

- ARX®6000 Connectors
- Console Connector and Pinouts
- SFP Optical Connector

ARX_®6000 Connectors

This appendix describes the cable connectors used on the ARX®6000 modules (see <u>Table A.1</u>).

Module	Connector	Purpose
System Control Module (SCM)	RJ-45	Ethernet management port Mirror port for port mirroring and diagnostics Serial console port
Network Services Module (NSM)		
Copper version	RJ-45	Six 100/1000BASE-T Ethernet ports ^a
Optical version	small form-factor pluggable (SFP)	Six optical ports for 1-Gbps Ethernet connections over multi-mode fiber



Fiber-optic ports (on modules) are shipped with cable connectors installed. These ports must be protected by a rubber grommet filler or a cable connector at all times to prevent dust from collecting in the transceiver.

Table A.1 Module Cable Connectors

a.NSM Gigabit Ethernet ports support automatic MDI/MDIX cross-over. This feature automatically corrects the polarity of the attached CAT5 cable, regardless if it is a cross-over or straight-through type. However, for this feature to work, the port must be set to "auto-negotiate" (enabled). When the port speed/duplex is forced (auto-negotiate is disabled), automatic MDI/MDIX cross-over is disabled, and you must cable the port using standard cross-over or straight-through cabling.

Console Connector and Pinouts

The serial Console port requires a rollover cable (RJ-45 to RJ-45) that is included with the ARX®-installation kit. This cable is sufficient for connecting to a Terminal Server. For a direct connection to the serial port on a management station (such as a laptop), an RJ-45 to DB9 adapter is also included in the kit.

Figure A.1 RJ-45 Male Connector

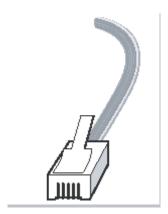


Figure A.2 RJ-45 to Serial DB9 Adapter



<u>Table A.2</u> lists the RJ-45 pinout assignments for the rollover cable and the adapter. The left column shows the transmit (TxD), ground (GND), and receive (RxD) signals. and the right column shows the signals reversed at the console device. The intervening columns show the pins that carry each of those signals.

SCM/ACM Console Port	RJ-45 Rollover Cable			RJ-45 to DB9 Adapter			Console Device
DTE Signal	RJ-45 Pinout	USOC Color	RJ-45 Pinout	RJ-45 Pinout	T568 Color	DB9F Pinout	DTE Signal
TxD	3	yellow	6	6	yellow	2	RxD

Table A.2 SCM Console Port Signaling/Cabling Using a Rollover Cable

SCM/ACM Console Port	RJ-45 Rollover Cable			RJ-	Console Device		
GND	4	green	5	5	green	5	Signal Ground
GND	5	red	4	4	red		Ground
RxD	6	black	3	3	black	3	TxD

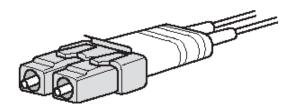
Table A.2 SCM Console Port Signaling/Cabling Using a Rollover Cable (Continued)

SFP Optical Connector

The Network Services Module (NSM) optical version uses small form-factor pluggable (SFP) optical connectors for connection to Ethernet over fiber-optic cable.

Figure A.3 shows an example SFP connector.

Figure A.3 SFP Optical Connector





Fiber-optic ports are shipped with cable connectors installed. These ports must be protected by a rubber grommet filler or a cable connector at all times to prevent dust from collecting in the transceiver.



B

Removing and Replacing FRUs

This chapter describes how to remove and replace the following field-replaceable units (FRUs) in the ARX®6000 chassis:

- Before You Begin
- Removing and Replacing Modules
- Removing and Replacing a Disk Drive
- Removing and Replacing the Fan Tray
- Removing and Replacing a Power Supply
- Removing and Replacing the Air Filter

Note

Other than the power supplies, these FRUs are hot-swappable components. You do not need to power off the switch before replacing them. However, module replacement often causes a reboot (and a failover, if the ARX^{\otimes} is the active peer in a redundant pair).

Before You Begin

WARNING

Static electricity can damage switch components. Be sure to wear antistatic wrist straps before handling hardware modules and disk drives. The plug is located on the left side of the cable guide on the bottom front of the chassis (shown in Figure 6.8 on page 6-14).

Removing and Replacing Modules

♦ Important

Removing a non-NSM module (or the only NSM) causes the switch to reboot.

In a redundant pair where this switch is active, services fail over to the junior switch. In a redundant pair where this switch is in the Backup/junior role, service is unaffected. A standalone switch does not offer any service for the duration of the reboot.

The module front panels provide ejector tabs that seat/unseat the modules in their slots in the chassis. Ejector tab positions indicate:

- Ejector tab down or closed (flush against the module): module is operational (online) (see <u>Figure B.1</u>)
- Ejector tab up or open (away from the module): module is not operational (offline)

To remove and replace a module:

- 1. Loosen the captive screws (top and bottom) on the module to be removed.
- 2. Release the ejector tabs (top and bottom) on the module.
- 3. Carefully slide the module out of its slot.
- 4. Insert the new module (of the same type) into the same slot by pushing on the front panel while simultaneously engaging the ejectors.

When the module connects (pins engage) at the backplane, the module is online.

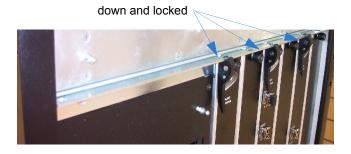
5. Tighten the captive screws (top and bottom) on the new module.

WARNING

For modules with fiber-optic ports:

Fiber-optic ports must be protected by a rubber grommet filler or a cable connector at all times to prevent dust from collecting in the transceiver.

Figure B.1 Ejector Tabs on Modules



Removing and Replacing a Disk Drive

WARNING

Static electricity can damage switch components. Be sure to wear antistatic wrist straps before handling disk drives and modules.

To remove a disk drive:

1. Insert a key and turn the lock to the right to release the drive handle. (The drive is locked when the notch is pointing up. When you turn the notch to the right, the handle will release (see <u>Figure B.2</u>).)

2. Pull the handle (hinged) toward you and slowly slide the disk drive out of the bay.

♦ Important

The drives must be locked to achieve proper seating in the drive bay.

Figure B.2 Removing a Disk Drive



Unlock key, then pull handle (hinged) out toward you

Keys:

Notch up drive locked

Notch to the right - drive unlocked

The chassis continues to run, in degraded state, with only one disk missing from the RAID.

Silencing the RAID Alarm

After you remove the drive, an audible alarm goes off to signal that the drive is missing. From the CLI (priv-exec mode), you can use the raid silence command to quiet this alarm:

raid silence

For example, the following command sequence logs into a switch at 10.1.27.69, enters enable to go to priv-exec mode, and silences the RAID alarm:

\$ telnet 10.1.27.69
Trying 10.1.27.69...
Connected to 10.1.27.69.
Escape character is '^]'.

Username: admin
Password: acopia
minturnA> enable
minturnA# raid silence

minturnA# ...

Replacing the Disk Drive

To replace the disk drive, slide it into the empty slot. Then use a key to lock the drive in place. Rotate the key counterclockwise until notch is pointing up.

Incorporating the Disk into the RAID

To incorporate the disk into the RAID, use the raid rebuild command from priv-exec mode:

raid rebuild {disk1 | disk2}

where **disk1** | **disk2** specifies the disk to rebuild. The top disk is disk1.

For example, the following command rebuilds the upper disk: minturnA# raid rebuild disk1 minturnA# ...

Removing and Replacing the Fan Tray

Remove the fan tray as described in <u>Removing the Fan Tray</u>, on page 6-7. To replace the fan tray, reverse the steps. (The entire fan tray is the FRU, not the individual fans.)



After 60 seconds, a busy ARX® may overheat without its fan tray. An ARX® with a light traffic load can last much longer. In any case, have the replacement fan tray ready before you remove a running fan tray from the chassis.

Removing and Replacing a Power Supply

Remove a power supply as described in *Removing the Power Supplies*, on page 6-7. To replace a power supply, reverse the steps.

DANGER

A chassis configured with two power supplies has two power cords. In the event that AC power must be removed from the system, disconnect both power cords before servicing the unit. Otherwise, the power-supply units keep a charge for 10-15 minutes, and you could get an electric shock by touching the pins on the back.

Removing and Replacing the Air Filter

WARNING

Customers are required to maintain the switch's air filter at regular intervals. Failure to do so may damage the switch.

To remove and replace the air filter:

- 1. Remove the air-filter front panel/cable guide by loosening the two captive screws on either side of the panel (see *Air Filter and Cable Management*, on page 6-13.) Be careful to keep cabling intact.
- 2. Slide the air filter out of the chassis and replace with a new air filter.
- 3. Reinstall the air-filter panel/cable guide over the air filter opening by aligning the holes and tightening the captive screws.



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A Adaptive Services Module features 4-5 front panel LEDs 4-5 Air filter 6-13 replacing B-7 Audience for this manual 1-3 B Bezel 6-9 Booting the switch 7-4	LEDs 8-7 removing 6-7 replacing B-6 File service protocols supported 2-5 Front bezel 6-9 FRUs air filter B-7 and static electricity B-3, B-4 disk drive B-4 fan tray B-6 modules B-3 power supply B-7
C Cable connectors A-3 Cable guides 6-13 Cable management 5-5 Cable requirements 5-5	Hard disks in an ARX6000 3-4 Hardware 3-3
Cabling the modules 6-13 Chassis configuration slot allocations 3-3, 3-6 Chassis installation safety instructions 6-3 tools required 6-3 Compliance regulatory 5-6 Configuring the switch 7-4	L LEDs disk drives 8-7 fan tray 8-7 module status and alert 8-6 port/link LEDs 8-7 Logical unit numbers (LUNs) 3-4
Connecting serial console port 7-3 Connecting the management port 7-14 Console port ARX6000 7-3 baud rate 7-3 connecting 7-3 connector A-3	M Management port connecting 7-14 Management ports 7-3 MGMT interface location on the ARX6000's SCM 7-3 Module connectors A-3 Module LEDs 8-6
D Diagnostics at switch bootup 8-3 Disk drives (fig.) 3-4 configuration 3-4 dual-channel bus 3-4 LEDs 3-5, 8-7 locking down with key B-5 LUNs 3-5	Modules ASM 4-5 fan tray 3-5 NSM 4-5 POST diagnostics 8-3 power consumption 5-4 replacing B-3 SCM 4-3
removing and replacing B-4 Dual-channel SCMs 3-4 E	N Network protocols 2-5 Network Services Module features 4-5
F Fan tray	O Operational status LEDs 8-6
features 3-5	

P	See Also Switch boot-up.
Ports	Switch management ports 7-3
LEDs 8-7	Switch replacement
management, console 7-3	See Switch Installation and Switch boot-up:for a
NSM (fig.) 4-7	replacement switch.
POST diagnostics 8-3	Switch-to-switch failover 2-4
Power consumption 5-4	System Control Module
Power cords	features 4-3
attaching 6-11	System power 5-3
Power ON/OFF switch 6-11	System specifications 5-3
Power requirements 5-4	
Power specifications 5-3	Т
Power supply	Tools for installation 6-3
(fig) 3-4	TOOIS TOT TITISCATIACION 6-3
features 3-3	
load-sharing 3-3	U
removing 6-7	Unpacking the switch 6-5
replacing B-7	, ,
Protocols supported 2-5	
R	
Rack-mounting the switch 6-9	
Redundancy	
between two ARX6000's 2-4, 3-7	
Regulatory compliance 5-6	
Removing and replacing a disk drive B-4	
Removing and replacing modules B-3	
Removing fan tray 6-7	
Removing the power supply 6-7	
Resilient Overlay Network (RON) 3-7	
Running the boot wizard 7-4	
S	
Safety instructions 6-3	
Serial console port 7-3	
Site installation requirements 6-3	
Slot assignments 3-6	
Specifications 5-3	
air filter 5-3	
airflow clearance 5-3	
chassis 5-3	
modules 5-4	
power 5-3	
system 5-4 Static electricity, R-3, R-4	
Static electricity B-3, B-4 Status LEDs 8-6	
Switch boot-up 7-4	
for a redundant switch 7-9	
for a replacement switch 7-9	
Switch Installation	
safety instructions 6-3	
tools required 6-3	
unpacking and installing the chassis 6-1	
Switch installation	